NPL - U36-3-6-2-R5
14373

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Re: Comments on Proposed Rule to List the Matthiessen and Hegeler Zinc Company Site on the National Priorities List, 66 Fed. Reg. 32287 (June 14, 2001)

Dear Docket Coordinator:

On behalf of Carus Chemical Company ("Carus Chemical") we submit these public comments on United States Environmental Protection Agency's ("EPA") proposal to list the Matthiessen and Hegeler Zinc Company Corporation Site ("M&H Site" or "Site") on the National Priorities List ("NPL") 66 Fed. Reg. 32287 (June 14, 2001). These comments consist of this letter and Technical Comments of GeoSyntec Consultants (attached as Attachment A).

Summary

Placing the M&H Site on the NPL on the basis of the present Hazard Ranking System ("HRS") Documentation Record would contradict EPA protocol and would fail to serve the public interest for several reasons. First, and most importantly, the scoring set forth in EPA's Documentation Record is technically flawed and results in an erroneous score. Even accepting the underlying data as accurate, a correct score for this Site based on applicable HRS guidance would fall below 28.5, as described further below and in Attachment A.

Second, the exclusion of Carus Chemical's main plant area is justified by legal, technical and practical considerations. Among other reasons, it is undisputed in the Documentation Record that Carus Chemical has not contributed to potential metal contamination of the Little Vermillion River. Because it did not contribute to any of the slag material or other waste from historic M&H operations, Carus Chemical should be considered an innocent landowner to the same extent as nearby residential property where contamination from former M&H operations might be located.

Third, the potential risks of the M&H Site simply do not rise to the level of a "priority." The sampling data used in scoring the M&H Site is not representative of site conditions, particularly with regard to the Carus Chemical property. Carus Chemical has conducted a substantial amount of investigation of its facility under the supervision of the Illinois EPA. Those investigations have not revealed a significant risk to human health or the environment. Although reports of these investigations were submitted to the Illinois EPA, the Documentation Record

does not take into account any of the data generated by Carus Chemical. Even sampling on residential property by governmental agencies do not support the HRS score.

The result of these and other factors is an incorrect, inflated HRS Score for the M&H Site that bears no relation to the conditions at the Site, potential threat to human health or the environment, or the need for further investigation. The two "sources" tested and scored for the Site by the Illinois Environmental Protection Agency ("Illinois EPA") simply do not create a significant enough hazard to human health or the environment to warrant listing the Site as a "priority." These factors point to the conclusion that the M&H is *not* a high enough priority to list on the NPL, a conclusion that is supported by the corrected HRS calculations submitted by GeoSyntec.

EPA must consider the fact that placement on the NPL can impose serious adverse legal and financial consequences for an owner of property, such as Carus Chemical Company, which hopes to continue business operations and employment at its facility. *Kent County v. EPA*, 963 F.2d 391, 394 (1992); *B & B Tritech, Inc. F/K/A B & B Chemical Co, Inc. v. EPA*, 957 F.2d 882, 885 (D.C.Cir.1992); *SCA Serv. of Indiana v. Thomas*, 634 F.Supp. 1355, 1361-66 (N.D.Ind.1986). In this case, the Documentation Record misinforms residents of LaSalle County about conditions at, and potential risks associated with, the M&H Site. EPA policy, scarce Superfund resources, responsible government, and the public interest all point to the conclusion that EPA should not list the M&H Site on the NPL. Indeed, inclusion of this Site on the NPL based on the existing Documentation Record would constitute an abuse of discretion, and arbitrary and capricious action on the part of EPA.

Discussion

I. Errors in the Documentation Record Result in a Flawed HRS Score.

Congress stated its clear purpose in establishing the NPL:

> The priority lists serve primarily informational purposes, identifying for the States and the public those facilities and sites or other releases which appear to warrant remedial actions.

S. Rep. No. 848, 96th Cong., 2d Sess. 60 (1980). In 1986, Congress amended section 105 of CERCLA to require that EPA revise its method of selecting NPL sites. Section 105 of CERCLA states that EPA:

> shall assure, to the maximum extent feasible that the hazard ranking system *accurately assesses the relative degree of risk* to human health and the environment posed by sites....

42 U.S.C. § 9605(c)(l) (emphasis added). It is therefore critical to the entire process that the procedures and guidelines by which sites are selected for the NPL are followed and implemented correctly.

In the case of the Documentation Record for the M&H Site, the errors by the Illinois EPA in following applicable HRS protocol contravene Congressional directives and applicable case law. The errors in the Documentation Record also contradict EPA's stated purpose of the NPL as an informational management tool, intended primarily to guide EPA in determining which sites warrant further investigation, to assess the nature and extent of the public health and environmental risks associated with the site, and to determine what CERCLA-financed remedial action, if any, might be appropriate. *See, e.g.,* 55 Fed. Reg. 6154, 6155 (Feb. 21, 1990).

EPA's proposal to add the M&H Site to the NPL must be justified by the Documentation Record that EPA has assembled. In EPA's words, the Documentation Record "serves as the rationale for listing a site." OSWER directive 9345.1-08 at 2 (Dec. 26, 1991). The Documentation Record must, therefore, provide a reasoned and cogent explanation for EPA's decision to list a site on the NPL. *See Motor Vehicle Mfrs. Assn. v. State Farm Mutual Auto Ins. Co.,* 463 U.S. 29, 48 (1983). Similarly, EPA must provide reasonable explanations for its conclusions that certain sources are likely to release a given contaminant via a certain pathway. *Tex Tin Corp. v. EPA,* 935 F.2d 1321 (D.C. Cir. 1991). Furthermore, the justification provided in the Documentation Record may not be based upon inaccurate or misleading information, unsupported assumptions or inadequate data. *See National Gypsum Co. v. EPA,* 968 F.2d 40, 44 (D.C. Cir. 1992).

The M&H Site Documentation Record falls woefully short of these legal standards. The Documentation Record contains errors in the scoring calculation that are fatal to the HRS result. The Illinois EPA scored the M&H Site on the basis of the Surface Water Migration Pathway. The Surface Water Pathway score attained the maximum value possible due to the toxicity factor assigned to cadmium, resulting in an overall calculated score for the Site of 50.0. As explained by GeoSyntec Consultants in its technical comments (Attachment A), the Illinois EPA selected the wrong toxicity factor for cadmium. The toxicity factor used in the Documentation Record corresponds to potential risk from *inhalation* of cadmium. For the human food chain calculation used to score the surface water pathway, however, a toxicity factor for cadmium in *food* should have been used. There has been a tremendous amount of scientific study on the effects of cadmium, and the results show unequivocally that cadmium might be carcinogenic through inhalation, but *not* through ingestion. Because the toxicity factor assigned to cadmium for inhalation is so much greater than that for ingestion (*i.e.,* 10,000 percent greater), the effect that this error has on the overall HRS score for the Site is enormous. Indeed, it is the incorrect and excessive value for cadmium *alone* that results in a score above the EPA's threshold. When the correct toxicity factor is applied, however, the toxicity/persistence/bioaccumulation factor value for cadmium is equivalent to that for lead. The result, as explained by GeoSyntec, is that the overall site score equals 27.0 based on the HRS Documentation Record. Because this score falls below the NPL threshold of 28.5, there is simply no basis to list the M&H Site on the NPL.

Because of the complex nature of the HRS calculations, the correct assignment of values in the scoring package is critical to the integrity of the process. In *National Gypsum Co., supra,* 968 F.2d at 43-44, EPA was found to act arbitrarily in assessing the toxicity and persistence scores for a site, and reversed the decision to list the site on the NPL. Also, in *Tex Tin, supra,*

935 F.2d at 1323, EPA's toxicity score was successfully challenged, and the site was ultimately removed from the NPL. *See Tex Tin Corp. v. EPA,* 992 F.2d 353 (D.C. Cir. 1993). Similarly here, there would be no reasonable explanation that could be offered for assigning cadmium's "inhalation" toxicity factor for purposes of the surface water/human food chain calculation.

There are other problems with the Documentation Record and proposed listing, in addition to the faulty scoring.

II. The Carus Chemical Facility Should Be Considered An Innocent Landowner and Disassociated With Contamination from the Former M&H Zinc Operations.

The Documentation Record identifies the Carus Chemical facility as located on portions of the former M&H property (pp. 21, 25), but neither of the two sources of hazardous substances scored by the Illinois EPA are located within the fence line of the Carus Chemical facility. In fact, most of the Carus Chemical facility is not even located on property formerly owned by M&H. Even if portions of the M&H Site would qualify for the NPL, those portions are not located within the fence line of Carus Chemical's main plant facility.

Carus Chemical has always been a separate operation from M&H and its successors, such as LaSalle Rolling Mills, which was located on the former M&H facility and is itself recently defunct. Furthermore, Carus Chemical is not responsible for any of the metals or other potential contamination from the M&H Site. To the extent any contamination from M&H operations exist on property now owned by Carus Chemical, Carus Chemical should be considered an innocent landowner in the same way as nearby residential property where contamination from M&H operations might be located. The Illinois EPA even acknowledges in the Documentation Record that Carus Chemical "does not contribute the metals associated with the Matthiessen and Hegeler site into the Little Vermilion River" (p. 25).

The Site Assessment Documents included with the Documentation Record also indicate that the proper focus of the site assessment and potential NPL listing is the abandoned areas of the former M&H operations, not the active Carus Chemical plant facility. The Carus Chemical facility was placed on the CERCLIS (IL 005477666), separately from and earlier than the M&H Site (IL 000064782), on the basis of historical chemical manufacturing operations. Similarly, the site known as Zinco, Inc. (IL 022254080) also was initially placed on CERCLIS separately from the M&H site. The Illinois EPA, however, in a letter to EPA Region V dated September 27, 1993, requested that the Zinco site be assigned a "Site Evaluation Accomplished status" because the M&H Site "includes the land on which Zinco (also called LaSalle Rolling Mills) is located" (Document ID no. 146876). In contrast, the Carus Chemical facility was not incorporated into the M&H Site under CERCLIS. In addition, the NPL Characteristics Data Collection Form prepared for the M&H Site (Document ID # 146169) identifies the site as "inactive or abandoned," having operated from 1858 to 1978 (section 2.6, p. 3), and, under the description of current site activities, indicates "none/currently inactive or abandoned" (section 3.1, pp. 4-5). This information in the Documentation Record is consistent with the purpose of CERCLA to provide a means to respond to abandoned hazardous waste sites. *See, e.g.,* H. Rep. 96-1016, Part 1, 96th Cong. 2d Sess. 93 1980) (noting that Superfund is to be used to find, assess and, where

warranted, clean up abandoned hazardous waste sites when the companies responsible no longer exist, cannot be found, or lack sufficient resources to respond). The Carus Chemical main plant facility is not an abandoned site, and the conditions of the Carus Chemical site have been adequately characterized in a series of investigative phases by its own consultant under the supervision and direction of the Illinois EPA. These facts present further reason to distinguish the current operational facility of Carus Chemical from the largely abandoned areas of the former M&H property. Whether or not EPA proceeds further with action at the M&H Site, further investigations of the Carus Chemical facility under CERCLA authority and the commensurate expenditure of public and private funds simply are not warranted. In addition to severe adverse consequences on the current business operations of a private company, such as Carus Chemical, the NPL process imposes substantial liability and responsibility on limited public resources, regardless of the how remedial action is ultimately financed.

Consequently, there appears to be no basis for including Carus Chemical's main plant facility as part of the M&H Site, either for purposes of scoring or for any subsequent determination of the Site's boundaries. The Illinois EPA appears to recognize that there is (and should be) a difference between the former M&H property lines and the "boundary" of the M&H Site. On several maps included in the Documentation Record, the Illinois EPA was careful to designate "Former Matthiessen & Hegeler Zinc Co. Property Boundary (*not site* boundary)." *See* Figures 2-2, 2-3, 2-4 and 4-2 (contained in Document ID no. 146171). *Compare* earlier marked versions of these same maps, which simply designate the same area as "property boundary." (Document ID nos. 146188, 146190, 146191 and 146195). While the Federal Register notice indicates that "the site properly understood is not limited to that property [owned by a particular party]," the notice also clarifies that the site "conversely may not occupy the full extent of the property" either. 66 Fed. Reg. at 32289. Although the formal site boundaries are not established as part of the HRS scoring process or the proposed listing, the current Documentation Record nevertheless results in a certain amount of confusion, misinformation and mischaracterization of the scope of the M&H Site, rather than serving as a reliable and objective source of public information.

III. The Potential Risks Do Not Rise to the Level of a "Priority."

One of the concerns identified by the Illinois EPA is the presence of the slag pile placed decades ago by former M&H along the banks of the Little Vermillion. While the slag pile is unsightly, it does not appear to present a significant risk to human health or the environment. Although it was not responsible for placing the slag material, Carus Chemical conducted significant work to investigate and evaluate portions of the slag pile that exist on property that it now owns beyond its fence line, in addition to investigation at its main plant facility. Carus Chemical performed this work after its own facility was placed on the CERCLIS. The HRS Documentation Record, however, does not take into account any of the results of the work performed by Carus Chemical. For example, one significant finding of Carus Chemical's investigation is that the high-temperature processes by which M&H generated the slag material causes the material to be resistant to leaching into the environment.

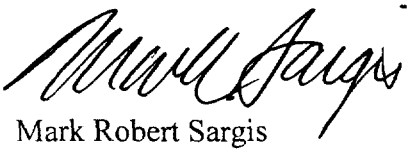
In addition, although several residential samples were taken in the vicinity of the M&H Site, both by Illinois EPA and the Illinois Department of Public Health (Public Health Assessment, September 30, 1999), these results also fail to support the high HRS score of this Site. The Illinois EPA acknowledges that "there was insufficient information [from residential sampling] to produce an accurate score" (p. 6). Furthermore, although the proposed NPL listing is based on a score that is dependent on the cadmium value, the IDPH assessment does not even mention cadmium as a potential off-site risk to the public health. In fact, the final assessment report dropped an earlier reference to cadmium as a potential health risk that was made in a published draft report. (Draft Public Health Assessment, February 1999). These sampling results, and the lack of any further action, support the view that there is no other basis in the Documentation Record for finding that cadmium is a significant enough health risk to warrant listing the M&H Site as a "priority."

Conclusion

For the reasons described above and as set forth in greater detail in Attachment A, the primary purpose of the NPL, EPA policy and guidance, CERCLA, the public interest, and common sense dictate that the M&H Site should not be included on the NPL. The scoring performed by the Illinois EPA is fatally flawed because it applies an incorrect toxicity factor for cadmium into the equation relating to the single pathway scored for the Site. Furthermore, there is no basis in the Documentation Record to include most of the Carus Chemical facility property, which is not contributing to potential metal contamination of surface water. Even the slag pile does not appear to present risks that rise to the level of the highest "priority" under CERCLA. Including the M&H Site on the NPL, and particularly the Carus Chemical facility, on the basis of the present Documentation Record and HRS score would therefore be arbitrary and capricious, and would constitute an abuse of discretion.

Very truly yours,

BELLANDE, CHEELY, O'FLAHERTY
SARGIS & AYRES



Mark Robert Sargis

MRS/bs
Enclosures

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8 August 2001

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Subject: Comments on Proposed Rule to List the
Matthiessen and Hegeler Zinc Company Site on the National Priorities List
66 Fed. Reg. 32287 (June 14, 2001)

Dear Docket Coordinator:

Enclosed herein are technical comments prepared by GeoSyntec Consultants (GeoSyntec) to the proposal by the U.S. Environmental Protection Agency (USEPA) to list the Matthiessen and Hegeler Zinc Company (M&H) Site on the National Priorities List. The enclosed technical comments were prepared by Nandra Weeks, P.E., and Robert DeMott, Ph.D., D.A.B.T., both of GeoSyntec.

Since 1993, Ms. Weeks has been intimately involved with the work performed at the Carus Chemical Company site, and serves as the lead project manager for the remedial investigations that have been performed to date. The Carus Chemical Company site is identified in the Documentation Record (Figure 2-2) as part of the former M&H property located in LaSalle, Illinois. Ms. Weeks has personally conducted and supervised the sampling, investigation and assessment of the Carus Chemical Company site. Dr. DeMott is a board-certified toxicologist who has worked in the area of human health risk assessment, including Superfund, for over eight years. He has provided written comments and/or testimony on several HRS scoring proposals and has personally completed rescoring efforts using the HRS guidance manual and USEPA PRE-SCORE software package.

Dr. DeMott and Ms. Weeks have identified discrepancies and errors in the Documentation Record for the M&H Site, the most significant of which are reflected in GeoSyntec's technical comments. Based on the HRS scoring prepared by Illinois

A

Environmental Protection Agency (IEPA), as discussed in the enclosed technical comments, and applicable USEPA protocol, the M&H Site does not qualify for inclusion on the National Priorities List.

Thank you for your consideration of these comments.

Sincerely,

Nandra D. Weeks, P.E.
Senior Project Manager

Robert P. DeMott, Ph.D., D.A.B.T.
Chemical Risk Practice Manager

Enclosure

FR0381/R010821

TECHNICAL COMMENTS

Proposed Listing of Matthiessen and Hegeler Zinc Company

OVERVIEW

Based on GeoSyntec Consultants' (GeoSyntec's) review of the Administrative Record and other pertinent documents, we have determined that the Hazard Ranking System (HRS) score proposed by Illinois Environmental Protection Agency (IEPA) was calculated incorrectly and that a number of significant technical issues should be documented in the record for this proposed listing. Based on our correction, the revised HRS score would be below the criterion that would justify National Priorities List (NPL) listing of the site. We have prepared this letter to document these conclusions and to address several key issues associated with the proposed listing of the Matthiessen and Hegeler (M&H) Zinc Company site, LaSalle, Illinois. The primary issues are discussed under the following headings:

- HRS Score Overview;
- Incorrect Human Food Chain Threat Score
- Sampling Data Used in Scoring Not Representative; and
- Exclusion of Main Plant Area.

This document presents a summary of actions conducted at the M&H Zinc Company and Carus Chemical Company Sites and addresses the primary issues listed above.

SUMMARY OF ACTIONS

The following two facilities were identified by the IEPA and placed on the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) for investigation: (i) Carus Chemical Company, ILD 005477666, listed in August 1990; and (ii) M&H Zinc Company, ILD 000064782, listed in September 1993. On 14 and 15 December 1993, the U.S. Environmental Protection Agency (USEPA) conducted a site assessment at M&H Zinc Company. The Carus Chemical Company and the M&H Zinc Company were listed separately on CERCLIS.

TECHNICAL COMMENTS

Proposed Listing of Matthiessen and Hegeler Zinc Company

In July 1992, attorneys for Carus Chemical Company retained GeoSyntec to assist in responding to administrative actions taken by the IEPA, including investigations conducted by the IEPA in the vicinity of the Carus Chemical Company plant located in LaSalle, Illinois. As part of its work, GeoSyntec reviewed results sent by the IEPA to Carus Chemical Company in May 1992 for soil, sediment, and groundwater samples collected by the IEPA. GeoSyntec also confirmed that the Carus Chemical Company Site had been placed on CERCLIS by the USEPA upon the recommendation of the IEPA. The IEPA's Remedial Project Management Section conducts investigations of CERCLIS sites under contract with and the direction of the USEPA, pursuant to a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Site Assessment Cooperative Agreement between the USEPA and the IEPA.

In June 1993, the Carus Chemical Company entered into the Illinois Pre-Notice Site Cleanup Program (Pre-Notice Program), now known as the Illinois Site Remediation Program, to prevent possible inclusion of its site on the NPL and to resolve potential liability under CERCLA. Under the Pre-Notice Program, Carus Chemical Company has performed a remedial investigation (RI) under the supervision and approval of the IEPA. This work was conducted in good faith that, pursuant to the IEPA's delegated CERCLA authority, Carus Chemical Company would be able to avoid further action under CERCLA and minimize the likelihood of Carus Chemical Company's site being listed on the NPL. Since the IEPA's acceptance of the Carus Chemical Company Site into the Pre-Notice Program, the following work has been conducted by the Carus Chemical Company and its consultant:

- in the main plant area and lowland areas owned by the Carus Chemical Company, 51 soil borings have been completed, totaling 1,515 ft of penetration;
- in the main plant area and lowland areas owned by the Carus Chemical Company, 41 soil or slag samples have been obtained and analyzed;
- 28 groundwater samples have been collected and analyzed; and

- the sediment and surface-water quality of the Little Vermilion River has been investigated by collecting and obtaining five river sediment and four river water samples.

HRS SCORE OVERVIEW

The HRS is the scoring system used by Superfund programs to assess the relative threats associated with actual or potential releases of hazardous substances. The HRS is the primary screening tool for determining whether a site is to be included on the NPL, the USEPA's list of sites that are priorities for further investigation and, if necessary, response action under the CERCLA or Superfund. The HRS and scoring methodology are specified by federal regulation at Title 40 Code of Federal Regulations (CFR), Part 300, Appendix A.

Any site obtaining an HRS score of 28.5 or greater is eligible for the NPL. This score does not represent a specified level of risk , but is a cut-off point that serves as a screening-level indicator of the highest priority releases or threatened releases.

There are four possible pathways (types) of exposure that can be scored. The HRS score used in the proposed listing of this facility was based upon the Surface Water Migration Pathway. Within this pathway, IEPA selected the option of scoring the Surface Water Overland/Flood Migration component. Within this component, there are several types of threats that can be considered, and IEPA selected the option of scoring the Human Food Chain Threat.

INCORRECT HUMAN FOOD CHAIN THREAT SCORE

The Surface Water Migration Pathway Score was derived incorrectly due to inappropriate calculation of the Surface Water Overland/Flood Migration Component subscore. The basis for this incorrect subscore was the use, in the Human ***Food Chain*** Threat score, of the cadmium toxicity value that is specified only for use with ***inhalation*** exposures. Correcting the Surface Water Overland/Flood Migration Component subscore results in a value of 54. This remains the component subscore identified as the Surface Water Migration Pathway Score, and recalculation of the HRS

Site Score using this revised Surface Water Migration Pathway Score results in a final value of 27, below the threshold for inclusion on the NPL. Details on the incorrect basis of the cadmium food chain toxicity value and the resulting recalculation are provided below.

Incorrect Toxicity Value for Cadmium

The HRS scoring process incorporates an element that is intended to account for the potency of hazardous chemicals that are scored in each pathway. A "Toxicity Factor" value is assigned for each chemical in each pathway in which it is included based on the degree of hazard that the chemical represents -- its potency. The scoring factor, obtained from Table 2-4 of the HRS (40 CFR 300, Appendix A), is selected depending upon the numerical values of standardized non-cancer and cancer toxicity values assigned by USEPA, typically listed in the Integrated Risk Information System (IRIS) database.

The overall HRS score for the proposed site was calculated incorrectly because the Toxicity Factor selected for cadmium in the human food chain pathway was not applicable for this pathway. Specifically, the Toxicity Factor that the IEPA assigned (10,000) corresponds to the toxicity value for ***inhalation*** cancer risk from cadmium. For the Surface Water/Human Food chain calculation, the value specifically identified in IRIS for cadmium in ***food*** should have been used. This would have resulted in a Toxicity Factor of 100 being assigned from HRS Table 2-4. (The subsequent effects on HRS score calculation are discussed below.)

Risks via the food chain are obviously not realized through inhalation exposure; therefore, the inhalation-based cancer slope factor (CSF) is inappropriate for cadmium exposure through food. IRIS lists a different toxicity value specifically identified for use with cadmium in food because cadmium is well understood to have differential toxicity depending on whether the exposure occurs through ingestion versus inhalation routes. In fact, cadmium is commonly the archetypal example of such route-dependent toxicity cited in toxicology textbooks. Where there is strong affirmative information regarding differential toxicity from ingestion and a specifically identified USEPA

toxicity value for use in conjunction with food, it is not correct to evaluate the Human Food chain Threat from cadmium using an ***inhalation*** CSF.

Cadmium is a textbook case of route-specific toxicity because it has been shown to be carcinogenic through one particular route of exposure (inhalation), but noncarcinogenic through other routes of exposure (ingestion and dermal). This characteristic is supported by data on human exposures, as well as laboratory animal studies.

On the basis of its potential to produce lung cancer following inhalation exposure, cadmium is currently classified by the USEPA as a Group B1 carcinogen; a probable human carcinogen with sufficient evidence from animal studies and limited evidence from epidemiological (human) studies.

Epidemiological studies have reported that occupational exposures to cadmium fumes and dusts via inhalation can be associated with increased incidences of lung cancers [Kazantzis et al., 1988; Thun, et al., 1985; Staynor et al., 1992]. Although increases in lung cancers were noted, confounding factors were later reanalyzed and concomitant exposures to other carcinogenic metals, such as arsenic and nickel, and cigarette smoking were subsequently reported as the cause of the cancers, not cadmium [Lamm et al., 1992, 1994; Sorahan et al., 1997]. This discrepancy among studies and reevaluations has lead to the USEPA (and other reviewers) concluding that the evidence for cadmium carcinogenicity is limited from human studies. Initial studies also reported increases in prostate cancer among occupationally exposed workers, but follow up investigations have not substantiated these reports, finding either no increases or insignificant increases among similarly exposed populations [Agency for Toxic Substances and Disease Registry (ATSDR), 1999]. Animal studies have supported the relationship between cadmium inhalation and lung cancer, but not other systemic cancers [Oldiges et al, 1989; Takenaka et al., 1983].

With regard to cadmium carcinogenicity, it is well documented that different exposure routes yield far different results [Collins et al., 1996]. This is further supported by the unwillingness of regulatory agencies, such as the USEPA, after extensively considering the option, to establish an oral CSF. After a review of the

available literature, the International Agency for Research on Cancer (IARC) [1993] agreed that although the carcinogenicity in humans of cadmium is supported via inhalation, the evidence for establishing cadmium as a carcinogen through other exposure routes is unfounded.

Evidence from both epidemiological and animal studies demonstrates that cadmium does not exhibit the same carcinogenicity from one route of exposure to another and therefore the toxicity data and regulatory values for these exposure routes should not be transposable.

Oral exposures to cadmium compounds have not found any associations with intake and increased cancer rates [Inskip and Beral, 1992; Lauwerys and De Wals, 1981; Shigematsu, 1984]. The endpoints for these studies included lung cancer and other cancers as well, such as prostate, kidney, and the urinary tract. Although renal diseases have been associated with increases in cadmium intake, after a study specifically detailing cadmium exposure, cadmium tissue levels, and renal cell carcinoma, researchers concluded cadmium was not a risk factor [Hardell et al., 1994].

Animal studies have also evaluated the potential carcinogenicity of cadmium through oral exposures. Although some cancer-related endpoints have been noted, no definitive evidence of carcinogenicity has been reported. In evaluating the evidence for cadmium carcinogenicity from animals, the USEPA states on IRIS [2001], "seven studies in rats and mice wherein cadmium salts (acetate, sulfate, chloride) were administered orally have shown no evidence of carcinogenic response".

Differences in absorption and the localized effect of cadmium on the lungs appear to be contributing factors to the differences in cadmium carcinogenicity between exposure routes. Cadmium is absorbed into the body much more readily through the inhalation pathway (10 to 50%), than through ingestion (~5%). This difference in absorption yields a lower body burden of cadmium when the primary route of exposure is ingestion.

Also, since it is lung cancers that are observed in association with inhalation exposure, and lung cancers do not result from other routes of exposure, cadmium carcinogenic potential is characterized as being a "point-of-contact" phenomenon. The

cancer associated with inhalation of cadmium dusts is localized to the lungs, the site of exposure. This is toxicologically significant since it appears that contact of cadmium fumes and dust with the affected tissue (lung) is necessary for the cancer response. This suggests that mechanisms of carcinogenesis related to irritation and repeated tissue injury are important. Such mechanisms of lung cancer would be expected to be less likely if the exposure was to cadmium already in the systemic circulation (e.g., absorbed into the bloodstream following ingestion). Thus, the observed finding that lung cancer responses differ between inhalation and ingestion exposure makes mechanistic sense. IARC [1993] also concluded that the established localization of exposure and subsequent carcinogenesis appears to relate to direct rather than a systemic carcinogenic mechanism. These factors further support the position that carcinogenicity representations based upon inhalation of cadmium are not relevant for ingestion exposures.

Since it is concise and illustrates how clear and unqualified the USEPA concluded that no CSF for oral exposure is warranted, the complete section of the cadmium IRIS record on potential ingestion carcinogenicity is quoted [IRIS, 2001]:

> "II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE
>
> Not available. There are no positive studies of orally ingested cadmium suitable for quantitation."

Although an inhalation CSF for cadmium has been established at 6.0 $(mg/kg/day)^{-1}$ by USEPA, no corresponding cancer-based toxicity value for the ingestion route (oral CSF) has been identified. This approach is supported by the lack of definitive evidence that cadmium causes cancer by the ingestion route. Collins et al. [1996] provides additional support for a lack of an oral CSF for cadmium by concluding that the potential for cadmium carcinogenesis from the oral route is likely to be extremely low from environmental conditions.

USEPA has, however, specified a non-cancer based toxicity value, reference dose (RfD), for use specifically with cadmium ingested in food. The oral (food) RfD listed in IRIS for cadmium is 0.001 mg/kg-day. This value has been available, along with the

narrative descriptions cited in part above, on IRIS for a number of years. There is nothing new or untried with regard to representing food ingestion of cadmium through the use of the oral (food) RfD. In fact, USEPA has assigned its highest category for the level of confidence that it ascribes to the cadmium oral (food) RfD on IRIS.

In summary, cadmium has an IRIS-specified oral RfD for food ingestion and there is agreement among USEPA and ATSDR that the toxicity values based on cadmium carcinogenic potential following inhalation exposure are only relevant for that particular route of exposure. In these circumstances, the cadmium oral RfD for food ingestion should have been used to determine the Toxicity Factor Value in the Human Food Chain Threat scoring, with a resultant value of 100 being assigned instead of the proposed 10,000. Details on how the corrected toxicity value, oral (food) RfD, would result in HRS scoring changes are provided in the following section.

Recalculation Demonstration with Correct Cadmium Toxicity Value

Using the HRS scoring system, IEPA calculated an HRS score of 50 for the M&H Zinc Company facility, resulting from the assignment of a pathway value of 100 for the Surface Water Migration Pathway. A step-by-step recalculation of the Surface Water Migration Pathway - Human Food Chain Threat Score is presented and the corresponding changes in the overall HRS score are shown below. As described in detail above, it was the incorrect identification of an inhalation cancer slope factor as the basis for deriving the cadmium Toxicity Factor Value in the Human Food Chain Threat that lead to the incorrect score. When this toxicity information is incorporated correctly, the HRS score is below the criteria for inclusion on the NPL.

The HRS scoring system for each pathway is based on a number of individual factors grouped into three categories: (i) likelihood of release or exposure, (ii) waste characteristics, and (iii) targets. Individual factors are evaluated and the factor values are combined mathematically to produce the pathway score.

The Surface Water Migration Pathway score calculated by IEPA is based, in part, on an assigned *Toxicity Factor Value* of 10,000 (Table 1). This value corresponds to the use of the inhalation cancer slope factor of 6.0E+00 $(mg/kg\text{-}day)^{-1}$ for cadmium. When correctly identified based on the oral RfD for cadmium in food, 0.001 mg/kg-day,

the assigned *Toxicity Factor Value* is 100. This decrease in the *Toxicity Factor Value* results in a concomitant decrease in the *Toxicity/Persistence/Bioaccumulation Factor Value* (Table 1).

Table 1. Derivation of Cadmium Toxicity/Persistence/Bioaccumulation Factor[1]

Component	IEPA Proposed Value	Corrected Value
Toxicity Factor Value[2]	*10000*	***100***
Persistence Factor Value	1	1
Bioaccumulation Value	5000	5000
Toxicity/Persistence/Bioaccumulation Factor[3]	5.0×10^7	5.0×10^5

[1] Following recalculation, cadmium still equaled the highest Toxicity/Persistence/Bioaccumulation factor value of the chemicals considered by IEPA in their HRS scoring package (the toxicity/persistence/ bioaccumulation factor for lead is equivalent to the recalculated factor for cadmium).
[2] Value obtained from Table 2-4 (40 CFR 300, Appendix A, Section 2.4.1.1). Based on an oral RfD (food) of 0.001 mg/kg-day from USEPA's IRIS database.
[3] Value obtained from Table 4-13 (40 CFR 300, Appendix A, Section 4.1.3.2.1).

When the new *Toxicity/Persistence/Bioaccumulation Factor Value* of 5.0×10^5 is used in the calculation of the Human Food Chain Threat Score for the Surface Water Pathway, the score is reduced from 100 to 54 (Table 2).

Table 2. Surface Water Pathway – Human Food Chain Threat

Component	IEPA Proposed Value	Corrected Value
Likelihood of Release		
1) Observed Release	550	550
Waste Characteristics		
15) Toxicity /Persistence/Bioaccumulation[1]	5×10^7	5×10^5
16) Hazardous Waste Quantity	10000	10000

17) Waste Characteristics[2]	560	180
Targets		
18) Food Chain Individual	45	45
19) Population	0.03	0.03
20) Targets	45.03	45.03
Human Food Chain Threat Score		
21) Human Food Chain Threat Score[3]	*100*	*54*

[1] See Table 1 for calculation of Toxicity/Persistence/Bioaccumulation factor value.
[2] Obtained from Table 2-7 (40 CFR 300, Appendix A, Section 2.4.3.2) based on values in lines 15 and 16.
[3] Calculation: [lines 1 × 17 × 20]/82,500, subject to a maximum of 100.

As discussed previously, this reduction in the Surface Water Pathway Score changes the overall HRS Score for the site. The recalculated HRS Score for the M&H Zinc Company site is 27. This is below the 28.5 value that serves as the threshold for inclusion of sites on the NPL.

Worksheet for Computing HRS Site Score

	IEPA Proposed Value		**Corrected Value**	
	S	**S^2**	**S**	**S^2**
1. Groundwater migration pathway score (S_{gw})	NS	NS	NS	NS
2a. Surface water overland/flood migration component	100	10000	54	2916
2b. Groundwater to surface water migration component	NS	NS	NS	NS
2c. Surface water Migration Pathway Score (S_{sw})[1]	100	10000	54	2916
3. Soil exposure pathway score (S_s)	NS	NS	NS	NS
4. Air migration pathway score (S_a)	NS	NS	NS	NS
5. Total of $S_{gw} + S_{sw} + S_s + S_a$	100	10000	54	2916
6. **HRS Site Score**[2]		**50**		**27**

NS – Pathway not scored.
[1] Enter the larger of lines 2a and 2b as the pathway score.
[2] Calculation: $HRSScore = \sqrt{\frac{S_{gw}^{2} + S_{sw}^{2} + S_{s}^{2} + S_{a}^{2}}{4}}$

SAMPLING DATA USED IN SCORING NOT REPRESENTATIVE

The limited and outdated analytical data used in the current HRS scoring effort introduces substantial uncertainty regarding the validity of both the approach and the resulting ability to adequately characterize the site.

Source 1 was scored on the basis of three samples of slag material collected in 1993. The area of this source was estimated on the basis of an aerial photograph from 1988. It is significant that: (i) Source 1 is only partly found on property owned by Carus Chemical Company; and (ii) Carus Chemical Company has been proactive in assessing the nature of this waste material and characterizing heterogeneities that appear to relate to the specific subareas and materials deposited at specific times. The underlying assumptions in scoring Source 1 on the basis of just three old samples is that the source is homogeneous, unchanging, and readily characterized as a single source spanning approximately 6 acres of property owned by different parties. Given the information that has already been obtained, this oversimplified characterization of an obviously complex potential waste source strains the credibility of the scoring process. While the HRS scoring process clearly makes room for characterization on the basis of extremely limited data where necessary (i.e., there is little to nothing known about a site), the process also requires that readily available information pertinent to understanding the characteristics of a site (such as waste heterogeneities) be considered.

The information used to score Source 1 clearly does not represent the overall information base that is available and relying on such limited information suggests that insufficient effort was made in the scoring to adequately characterize the source. A clear example of this deficiency is the IEPA's failure to include in their narrative description of Source 1 mention of the specific high-temperature treatment process from which M&H generated slag material. This process specifically results in metals forms that are

highly resistant to further leaching. This characteristic of the waste is relevant to a proper understanding of its potential migration.

Source 2 was scored on the basis of five samples from 1993, also identified as waste materials. Again, the area of the source was identified with an even older aerial photograph. Source 2 is not located on property owned by Carus Chemical Company. Carus Chemical Company understands that this portion of the M & H Zinc Company property has also been more thoroughly investigated than the use of 5 samples would suggest. This source also should have been evaluated more thoroughly, consistent with the readily available information about the potential source area.

Summarizing these issues with the number and age of samples that were used as the basis for the proposed scoring, it is the representation of the site in the proposed listing package based upon such limited information that is significant. This site is substantially better understood and has been better characterized than a few 8 year-old samples would suggest.

EXCLUSION OF MAIN PLANT AREA

We believe that there are several arguments that support exclusion of the main plant (active) area of the Carus Chemical Company from the M&H Zinc Company Site boundary, as discussed below.

No Scoring of Any Source on Main Plant Area

The scoring was based on two source areas, neither of which is located on the main plan of the Carus Chemical Company. Based on a review of historical documents and the results of the extensive investigations performed at the Carus Chemical Company, no slag is present on the main plant area of the Carus Chemical Company.

Main Plant Area Material Different Than Sources 1 and 2

Since HRS scoring is intended to be a "screening level" exercise to help prioritize potential sites for Superfund, the scoring process does not necessarily consider a

comprehensive characterization of the site that has been developed through extensive site investigation. However, such information is clearly relevant to the degree of risk to human health and the environment that a proposed site poses. In the case of the Carus Chemical Company facility, extensive additional information is available to refine the characterization of the potential site risks.

Plant Site Originally Listed on CERCLIS Separately

As previously discussed, the Carus Chemical Company and the M&H Zinc Company were identified separately by IEPA and placed on CERCLIS. The boundaries of the M&H Zinc Company property presented in Figure 2-2 of the HRS Documentation Record appear to incorporate the entire contiguous Carus Chemical Company properties, including the main plant area, as well as other portions of property currently owned by the Carus Chemical Company. The main plant area of the site contains all of the Carus Chemical Company manufacturing and distributing facilities. This main plant area was not an integral part of the M&H Zinc Company operations. The lowland area and former railroad right-of-way are located east of the main plant area of the Carus Chemical Company. Carus Chemical Company purchased the lowland area from the M&H Zinc Company in 1973. The parcel contains the outfall for non-contact cooling water from the Carus Chemical Company plant, a holding pond with a regulated National Pollution Discharge Elimination System (NPDES) discharge point to the Little Vermilion River, as well as a portion of the slag pile (Source No. 1 in the HRS Documentation Record). The slag pile consists of material from the zinc smelting operations conducted at the former M&H Zinc Company prior to acquisition by the Carus Chemical Company.

HRS Record: Carus Chemical Company Not Contributor to Metals in River

The manufacturing operations (main plant area) of the Carus Chemical Company do not contribute to the metal impacts documented in river sediment samples by the IEPA. The source of the metal impacts were reported in the HRS Documentation Record to be from run-off to the Little Vermilion River from two waste piles which have been identified as: (i) a slag waste pile containing elevated levels of lead, cadmium, zinc, and copper located in the southeast portion of the former smelter

property (Source No. 1, a portion of which is on property now owned by the Carus Chemical Company); and (ii) a shallow waste pile containing elevated levels of cadmium, copper, chromium, lead, nickel, and zinc located on the former smelter property (Source No. 2, located on the former M&H Zinc Company facility). Neither sources of run-off that contribute to the metals in the river are located on the main plant area of the Carus Chemical Company. The IEPA also acknowledges in the Documentation Record that Carus Chemical "does not contribute the metals associated with the Matthiessen and Hegeler site into the Little Vermilion River" (p. 25).

CLOSURE

In conclusion, based on a comprehensive technical review of the proposed listing package for the M&H Zinc Company, LaSalle Illinois, GeoSyntec has identified significant technical issues associated with the HRS scoring, most importantly the assignment of an inappropriate numerical value representing the toxicity of cadmium as a Human Food Chain Threat. The revised overall HRS score that we have calculated after incorporating the corrected cadmium value for the food chain was less than the 28.5 threshold for NPL listing. Accordingly, there is currently no defensible scientific basis consistent with the HRS that can support the proposed listing.